2014

MISSOURI WILD TURKEY HARVEST AND POPULATION STATUS REPORT

Missouri Department of Conservation

Resource Science Division

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POPULATION STATUS

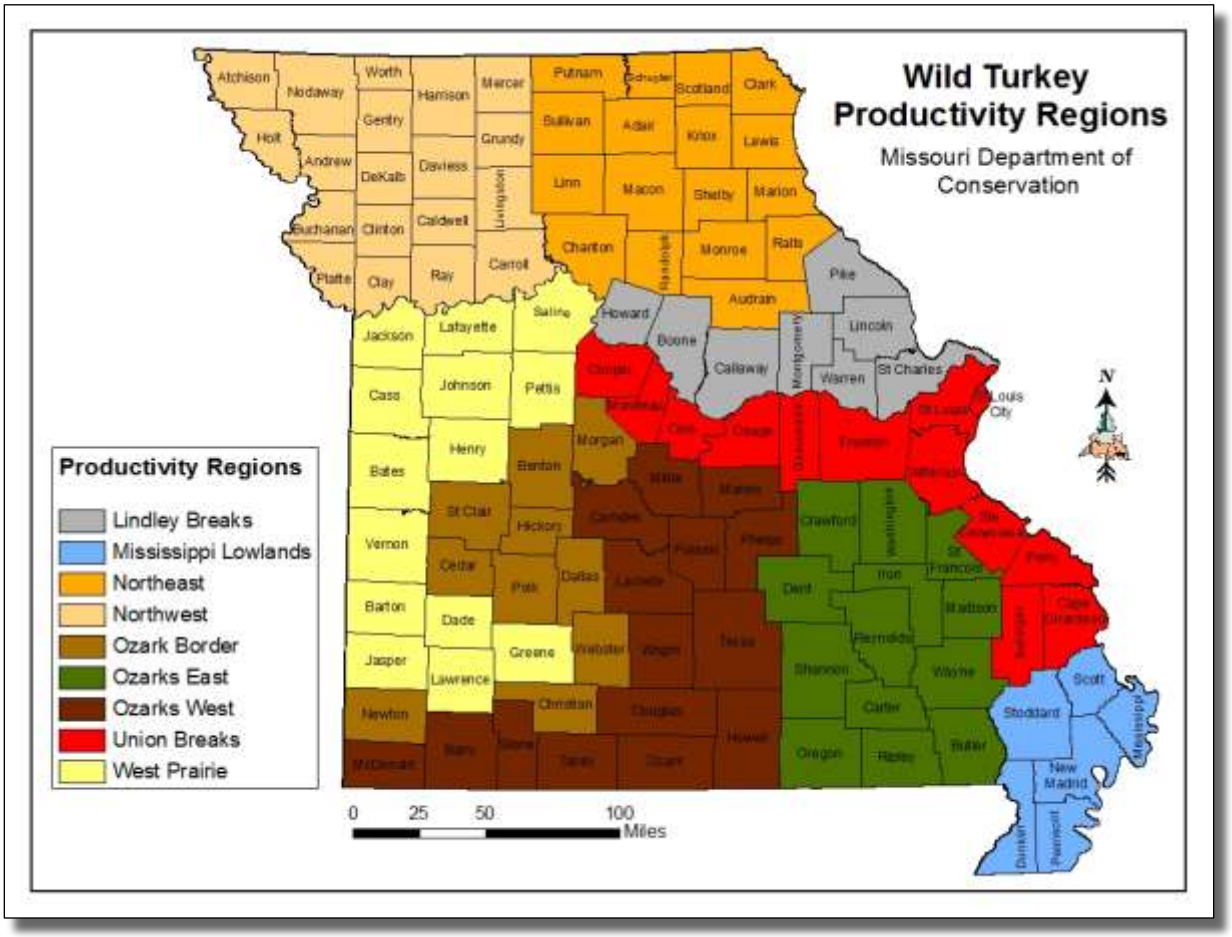
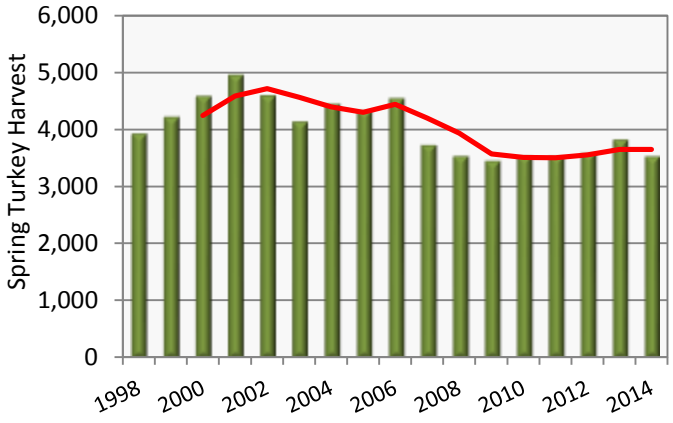


Figure 1. Turkey Productivity Regions in Missouri. Regions consist of counties grouped by similar land cover composition.

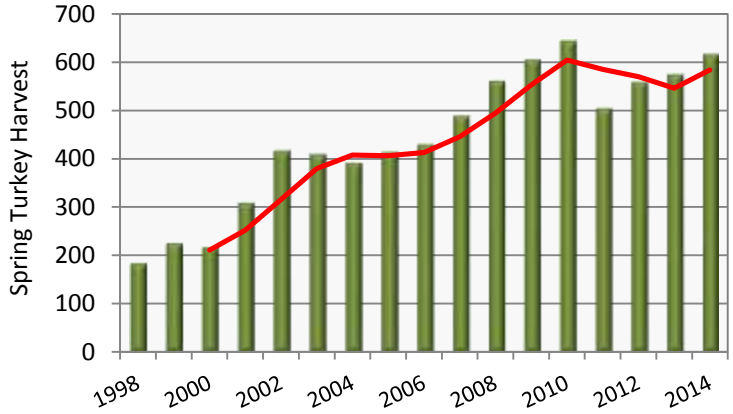
Lindley Breaks Region

Turkey numbers in the Lindley Breaks region (Figure 1) peaked in the early 2000s before declining by about 30% from 2001–2009. Although improved production has helped to stabilize regional turkey numbers, abundance continues to remain below the peak numbers observed more than a decade ago.



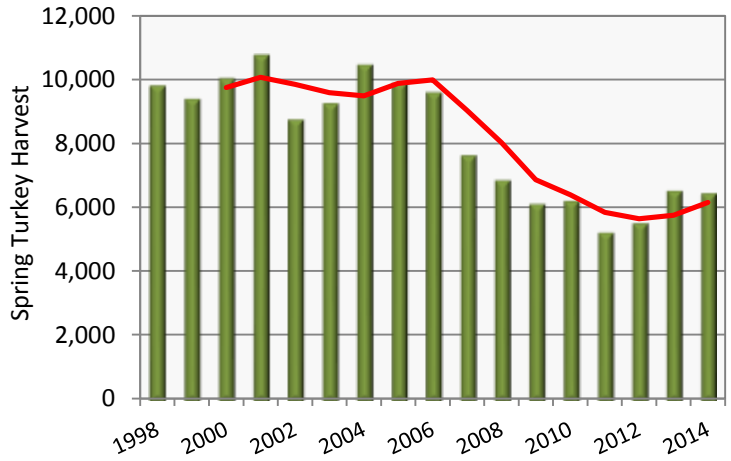
Mississippi Lowlands Region

Unlike other regions, turkey numbers in the Mississippi Lowlands region (Figure 1) increased during the 2000s. Turkey habitat within the region is limited, resulting in low regional harvests compared to other regions. Abundance in Stoddard County has declined in recent years, however, regional turkey numbers are currently stable (Figure 2).



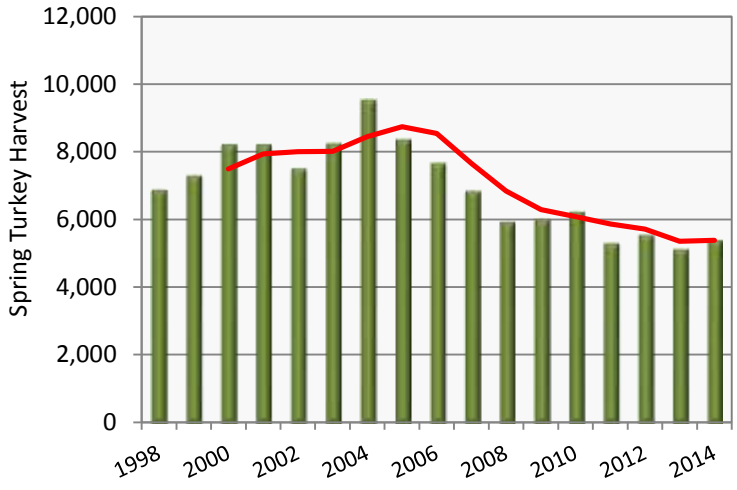
Northeast Region

Six consecutive years of poor production caused turkey numbers in the Northeast region (Figure 1) to decline by about 40% during the late 2000s. Although improved production in recent years has stabilized the regional population, turkey numbers remain 35–40% below those observed during the late 1990s and early 2000s. Regional production was the highest in the state in 2014.



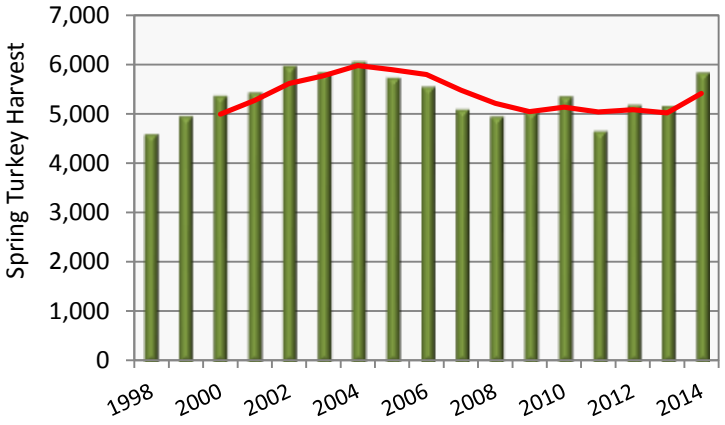
Northwest Region

Similar to the Northeast region, poor production caused turkey numbers to decline sharply in the Northwest region (Figure 1) during the mid-to-late 2000s. Although regional production has displayed an increasing trend for the last six years, turkey numbers remain 40–45% below the population peak of the early 2000s. Most counties within the region have stable numbers, however, numbers have failed to stabilize in several counties, particularly in extreme northwestern Missouri (Figure 2).



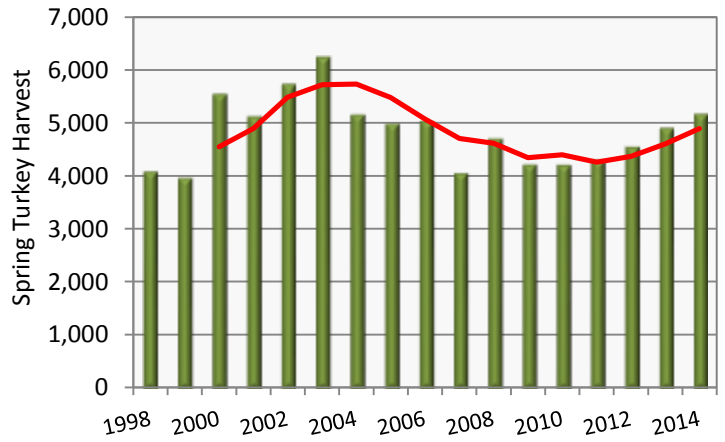
Ozark Border Region

Turkey numbers in the Ozark Border region (Figure 1) peaked in the early 2000s as they did in most of the state before declining during the mid-to-late 2000s. Regional turkey numbers are stable and currently about 10% below peak numbers. The region continues to have many of the top turkey harvest counties in the state.



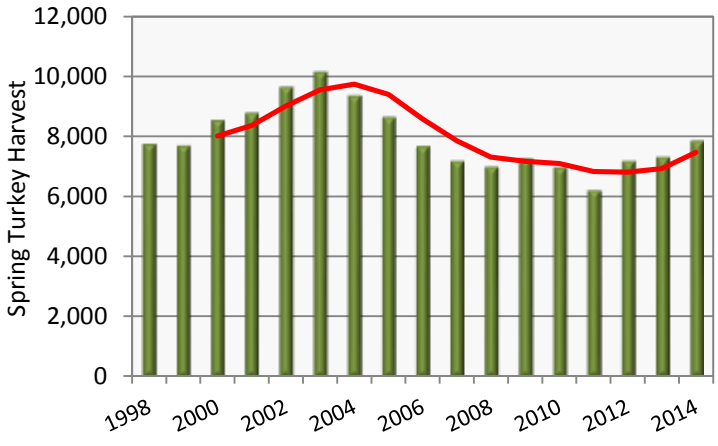
Ozarks East Region

Unlike most counties in Missouri, where turkey numbers are stable, turkey abundance in most of the Ozarks East region (Figure 1) has increased in the past five years. The region has experienced some of the state's best turkey production in recent years, which has spurred population growth throughout most of the region's counties. Despite increasing abundance, regional turkey numbers remain 20–25% below the peak observed during the early 2000s.



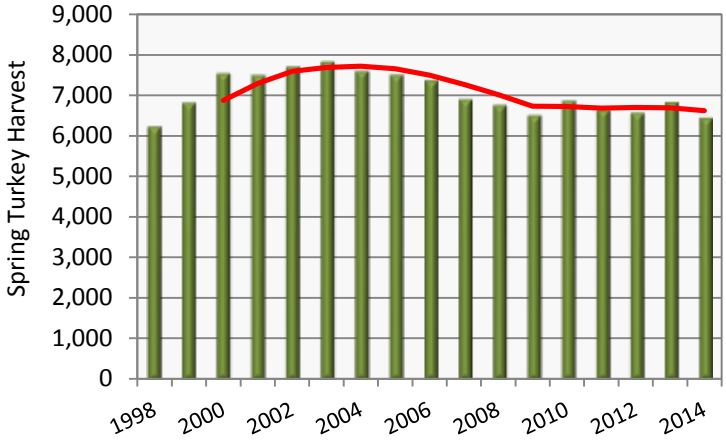
Ozarks West Region

Turkey numbers in many of the counties in the northern portion of the Ozarks West region (Figure 1) have increased during the past five years (Figure 2). Turkey numbers in the southern portion of the region are stable. Regional numbers remain about 20–25% below the population peak that occurred during the early 2000s. Like the Ozark Boarder region, many of the counties in this region consistently rank among the highest in the state for turkey harvest.



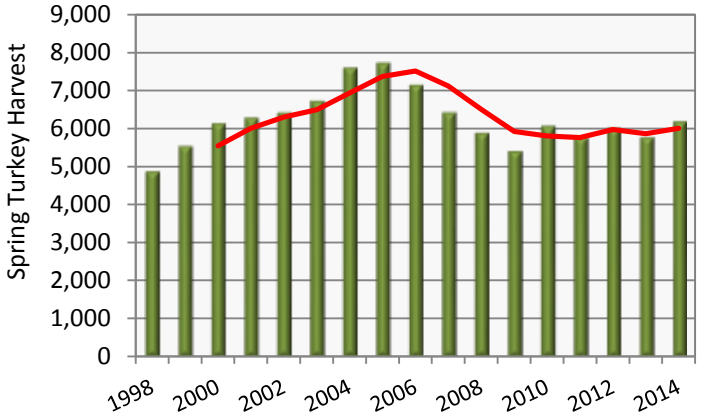
Union Breaks Region

Turkey numbers in the Union Breaks region (Figure 1) have been stable since the late 2000s and remain about 15–20% below peak numbers of the early 2000s. Containing a good mix of forested and open land cover types, this region contains some of the state's best turkey habitat and its counties consistently rank among the highest in the state in turkey harvest.



West Prairie Region

Turkey numbers in most of the West Prairie region (Figure 1) have been stable for the past five years (Figure 2). Similar to the population trend in the Northwest region, turkey numbers peaked during the early-to-mid 2000s in the region. Regional turkey numbers remain 20–25% below the population peak.



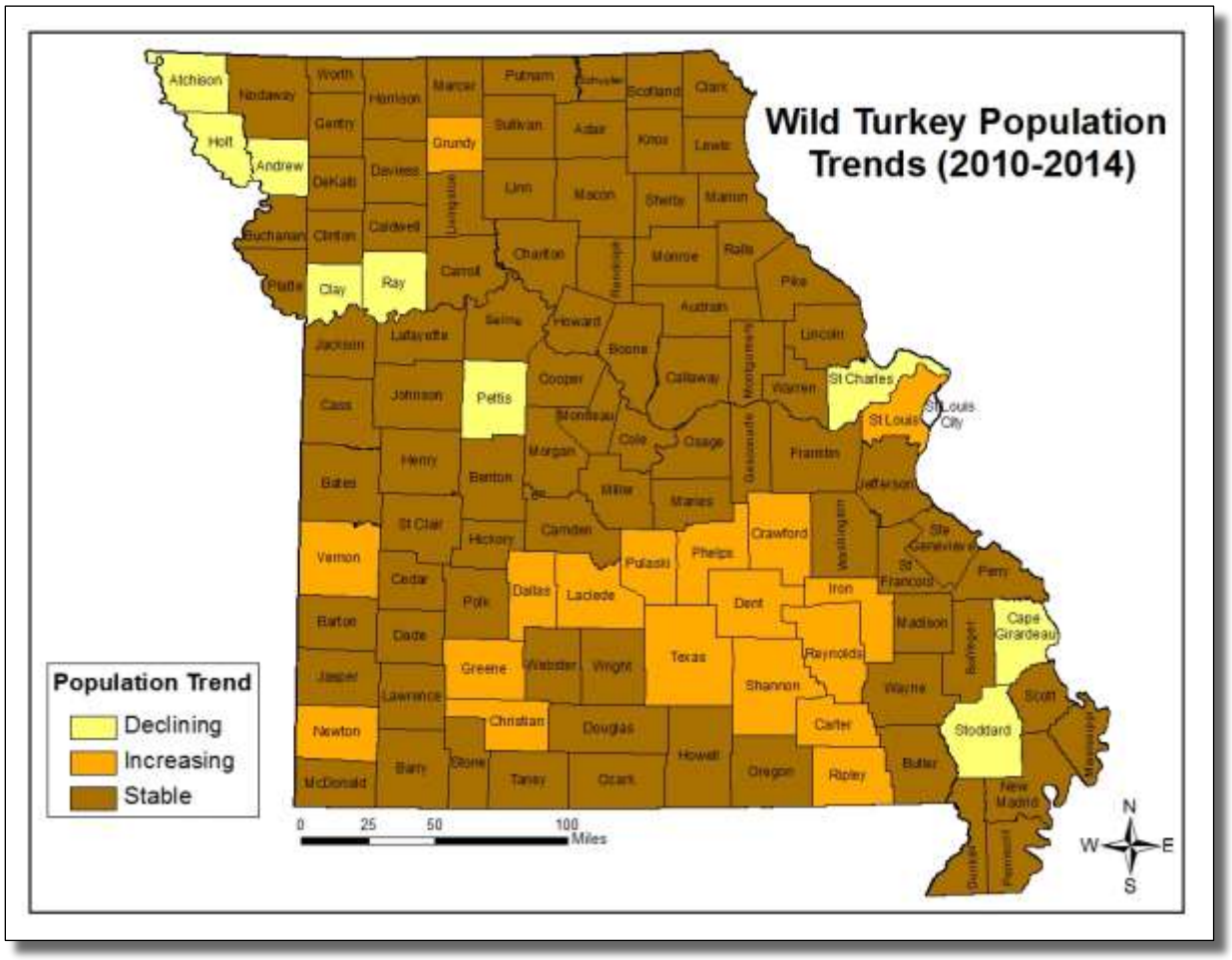


Figure 2. Five year (2010–2014) county-level wild turkey population trends in Missouri based on total (youth and regular season) spring harvest as an index to population abundance.

REPRODUCTION – WILD TURKEY BROOD SURVEY

The MDC has been conducting a Wild Turkey Brood Survey annually since 1959. During the survey, Department staff and citizen volunteers record observations of hens, poults, and gobblers during June, July, and August. Turkey sightings are recorded on observation cards, which the MDC mails to participants at the beginning of each survey month. By recording observations of hens and poults, survey participants provide information that serves as an index to turkey production. It is through this survey that the MDC determines the success of each year's turkey hatch. Turkey observations are collected at the county-level and analyzed by Turkey Productivity Region (Figure 1), which are counties grouped by similar land cover composition.

The MDC staff determines the percentage of hens observed with and without poults, as well as the average number of poults per hen for those hens observed with a brood. Observations of hens and poults are used to determine the poult-to-hen ratio, which is the average number of poults per hen. The poult-to-hen ratio includes observations of hens observed with a brood and those observed without a brood. In 2014, MDC staff and citizen volunteers recorded observations of over 69,000

turkeys during the three-month survey, including over 4,500 broods (Table 1). At the statewide scale, 45% of hens were observed with a brood (Table 2). The percentage of hens observed with a brood ranged from 38% in the Ozarks West region to 51% in the Lindley Breaks region. Statewide, the average brood size was 4.4 poults (Table 2). Average brood size ranged from 4.3 poults in the Lindley Breaks, Mississippi Lowlands, and West Prairie regions to 4.9 poults in the Ozark Border region.

Table 1. Wild turkey observations by Turkey Productivity Region (Figure 1). Data were obtained during Missouri's Wild Turkey Brood Survey conducted in June, July, and August, 2014.

Productivity Region	Hens w/ Broods	Hens w/o Broods	Total Hens	Poults	Broods	Gobblers
Lindley Breaks	968	944	1,912	4,129	520	1,026
Mississippi Lowlands	87	111	198	370	47	114
Northeast	952	1,126	2,078	4,599	564	1,544
Northwest	609	717	1,326	2,812	351	1,143
Ozark Border	1,162	1,476	2,638	5,659	612	1,867
Ozarks East	691	924	1,615	3,172	397	818
Ozarks West	1,059	1,723	2,782	4,748	528	1,701
Union Breaks	1,845	2,095	3,940	8,273	990	2,221
West Prairie	934	1,342	2,276	4,048	464	2,146
Statewide[a]	**8,696**	**10,514**	**19,210**	**37,924**	**4,531**	**12,633**

[a]Statewide totals include observations where Productivity Region was not recorded on the survey form.

The 2014 statewide poult-to-hen ratio (PHR) of 1.7 was 31% higher than the 2013 ratio, and 21% and 26% higher than the five and 10-year statewide averages, respectively (Table 3). The 2014 statewide PHR was the same as the 20-year average. Among Turkey Productivity Regions, PHRs ranged from 1.3 in the Ozarks West region to 2.0 in the Northeast region (Table 3).

Prior to 2011, Missouri's wild turkey population had experienced four consecutive years of poor production characterized by lower nest success and poult survival. The average PHR during this period was 1.1. In contrast, the average PHR from 2011–2014 was 1.6, a 45% increase. Particularly encouraging in 2014 was an improvement in production in the Northeast and Northwest regions, which were most affected by the downturn in turkey numbers during the 2000s. Although turkey production in recent years has not reached the levels observed during the late 1990s and early 2000s, PHRs have displayed an increasing trend during the last several years (Figure 3).

Table 2. Wild Turkey Brood Survey data by Turkey Productivity Region (Figure 1). Data were obtained from Missouri's Wild Turkey Brood Survey conducted in June, July, and August, 2014.

Productivity Region	% Hens w/ Poults	Average Brood Size	Poult-to-Hen Ratio	Gobbler-to-Hen Ratio
Lindley Breaks	51%	4.3	1.8	0.54
Mississippi Lowlands	44%	4.3	1.5	0.58
Northeast	46%	4.8	2.0	0.74
Northwest	46%	4.6	1.9	0.86
Ozark Border	44%	4.9	1.8	0.71
Ozarks East	43%	4.6	1.8	0.51
Ozarks West	38%	4.5	1.3	0.61
Union Breaks	47%	4.5	1.7	0.56
West Prairie	41%	4.3	1.4	0.94
Statewide[a]	**45%**	**4.4**	**1.7**	**0.66**

[a]Statewide totals include observations where Productivity Region was not recorded on the survey form.

Table 3. Index (poult-to-hen ratio) of Missouri turkey production listed by Turkey Productivity Region (Figure 1). Data were obtained from the 2014 Wild Turkey Brood Survey and are compared to previous years. For each interval value, the % change indicates how the 2014 index compares to the previous year or the average for periodic intervals.

Productivity Region	2014 Index	1-year (2013) Change	5-year (2009-2013) Change	10-year (2004-2013) Change	20-year (1994-2013) Change
Lindley Breaks	1.8	+50%	+18%	+28%	-3%
Mississippi Lowlands	1.5	+150%	-11%	-18%	-28%
Northeast	2.0	+43%	+45%	+54%	+22%
Northwest	1.9	+90%	+51%	+46%	+4%
Ozark Border	1.8	+80%	+48%	+49%	+10%
Ozarks East	1.8	+6%	-1%	+4%	-8%
Ozarks West	1.3	-13%	-6%	-2%	-20%
Union Breaks	1.7	+42%	+27%	+25%	+4%
West Prairie	1.4	+40%	+15%	+25%	-16%
Statewide[a]	**1.7**	**+31%**	**+21%**	**+26%**	**Same as Avg.**

[a]Statewide totals include observations where Productivity Region was not recorded on the survey form.

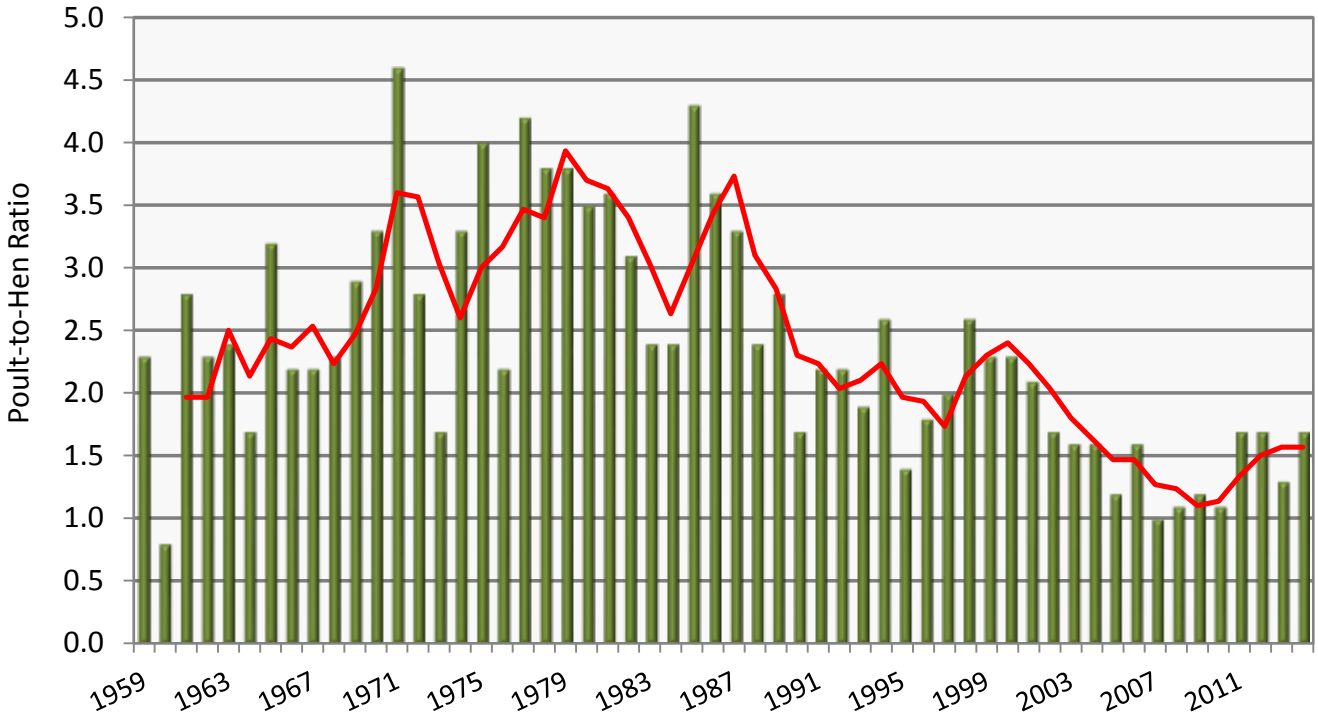


Figure 3. Missouri statewide poult-to-hen ratios derived from the Wild Turkey Brood Survey conducted in June, July, and August, 1959–2014. Trendline (red) displays three-year moving average.

HARVEST

2014 Spring Turkey Season

During the 2014 youth spring turkey season, which took place on April 12–13, hunters harvested 4,329 turkeys. This harvest total represented a 10% increase from the 2013 youth season harvest and was 14% higher than the previous five-year average. The 2014 youth season harvest was the highest since the season was initiated in 2001. Hunters harvested 43,274 turkeys during the 21-day regular spring turkey season, which occurred April 21 – May 11.

Juvenile male turkeys represented 16% of the regular season harvest (Figure 4), which was 24% lower than the previous five-year average. The total 2014 spring harvest, including both the youth and regular seasons, was 47,603. This harvest total represented a 3% increase from the 2013 harvest, and was 6% higher than the previous five-year average (Table 4). Counties with the highest total spring harvest in 2014 were Franklin, Texas, and Laclede, where 1,028, 1,010, and 828 turkeys were harvested, respectively (Figure 5).

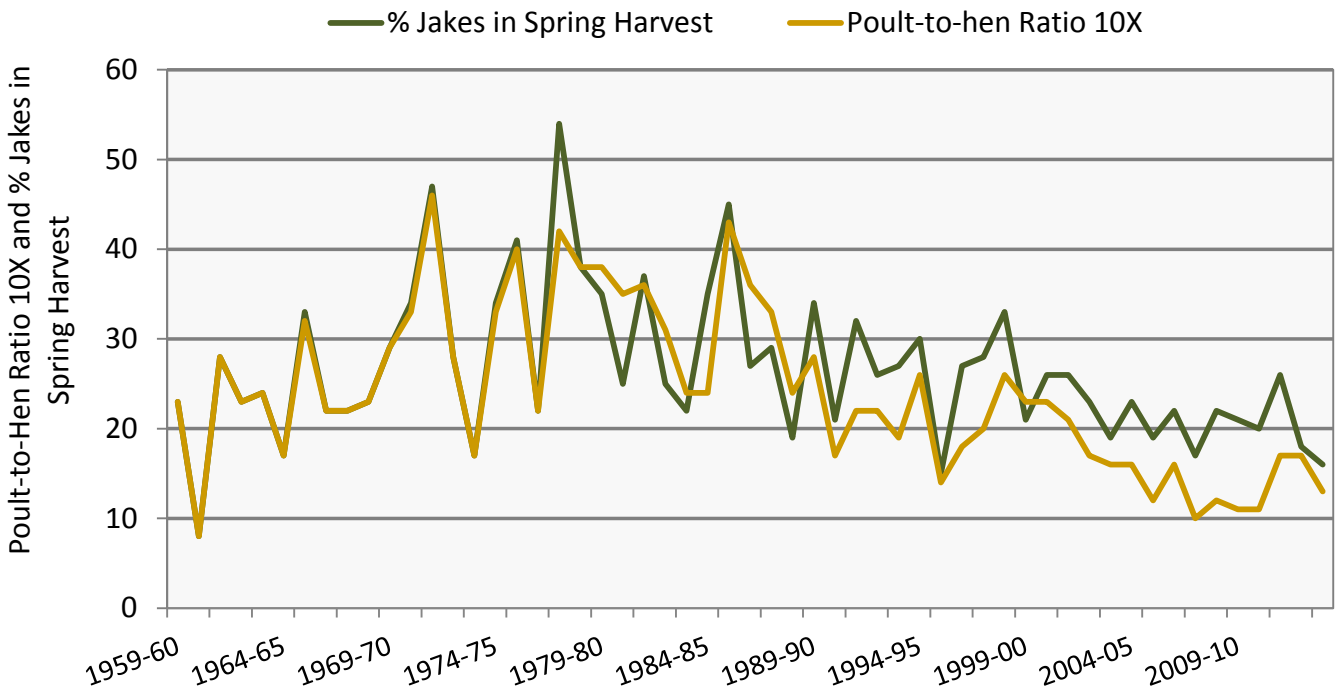


Figure 4. Missouri's statewide poult-to-hen ratio multiplied by 10, compared with the percentage of jakes in the following year's regular season spring harvest, 1959-2014.

Table 4. Total spring turkey harvest (regular and youth seasons) and permit sales[a] in Missouri, 1960-2014.

Year	Spring Harvest	% Change From Previous Year	Spring Permit Sales[a]	% Change From Previous Year
1960[b]	94	n/a	698	n/a
1961	154	+63.8	1,001	+43.4
1962	183	+18.8	1,400	+39.9
1963	357	+95.1	1,778	+27.0
1964	369	+3.4	2,958	+66.4
1965	476	+29.0	3,099	+4.8
1966	572	+20.2	4,873	+57.2
1967[c]	1,191	+108.2	6,702	+37.5
1968	1,270	+6.6	8,102	+20.9
1969	959	-24.5	7,577	-6.5
1970	1,598	+66.6	10,072	+32.9
1971	2,864	+79.2	12,306	+22.2
1972[d]	4,456	+55.6	20,077	+63.1
1973[e]	5,724	+28.5	29,633	+47.6
1974	5,286	-7.7	26,363	-11.0
1975	5,583	+5.6	28,621	+8.6
1976	7,851	+40.6	35,932	+25.5
1977	9,966	+26.9	36,596	+1.8
1978	10,203	+2.4	42,244	+15.4
1979	13,741	+34.7	46,008	+8.9
1980	16,722	+21.7	56,133	+22.0
1981	22,319	+33.5	63,914	+13.9
1982	17,744	-20.5	67,150	+5.1
1983	19,063	+7.4	73,347	+9.2
1984	19,317	+1.3	76,053	+3.7

[a]Does not include no-cost landowner permits
[b]3-day season with one-bird bag limit
[c]Season length increased to seven days
[d]Season length increased to 14 days
[e]Bag limit increased to two turkeys

Table 4. Continued.

Year	Spring Harvest	% Change From Previous Year	Spring Permit Sales[a]	% Change From Previous Year
1985	24,770	+26.6	69,945	-8.0
1986	30,965	+25.0	77,972	+11.5
1987	35,951	+16.1	85,723	+9.9
1988	33,187	-7.7	94,301	+10.0
1989	35,618	+7.3	92,901	-1.5
1990	30,056	-15.6	92,093	-0.9
1991	32,237	+7.3	89,077	-3.3
1992	33,035	+2.5	89,803	+0.8
1993	34,354	+4.0	89,899	+0.1
1994	37,721	+9.8	90,810	0.0
1995	37,472	-1.2	99,412	+8.8
1996	37,708	+0.3	99,879	+0.5
1997	33,216	-12.4	99,933	+0.1
1998[f]	48,462	+45.9	105,518	+5.6
1999	50,299	+3.8	110,939	+5.1
2000	56,841	+13.0	115,190	+3.8
2001[g]	57,842	+1.7	117,736	+2.2
2002	57,034	-1.3	125,157	+6.3
2003	58,421	+2.4	130,021	+3.8
2004	60,744	+3.9	124,533	-4.2
2005	57,743	-5.2	120,215	-3.5
2006	54,712	-5.2	114,529	-4.8
2007	48,472	-11.0	115,897	+1.2
2008	46,134	-4.4	115,047	-0.7
2009	44,713	-3.5	112,579	-2.1
2010	46,194	+3.3	105,501	-6.3
2011	42,220	-8.6	101,106	-4.2
2012	44,766	+6.0	101,534	+0.4

[f]Season length increased to 21 days

[g]Two-day youth season initiated

Table 4. Continued.

Year	Spring Harvest	% Change From Previous Year	Spring Permit Sales[a]	% Change From Previous Year
2013	46,141	+3.0	115,020	+13.3
2014	47,603	+3.0	110,636	-3.8

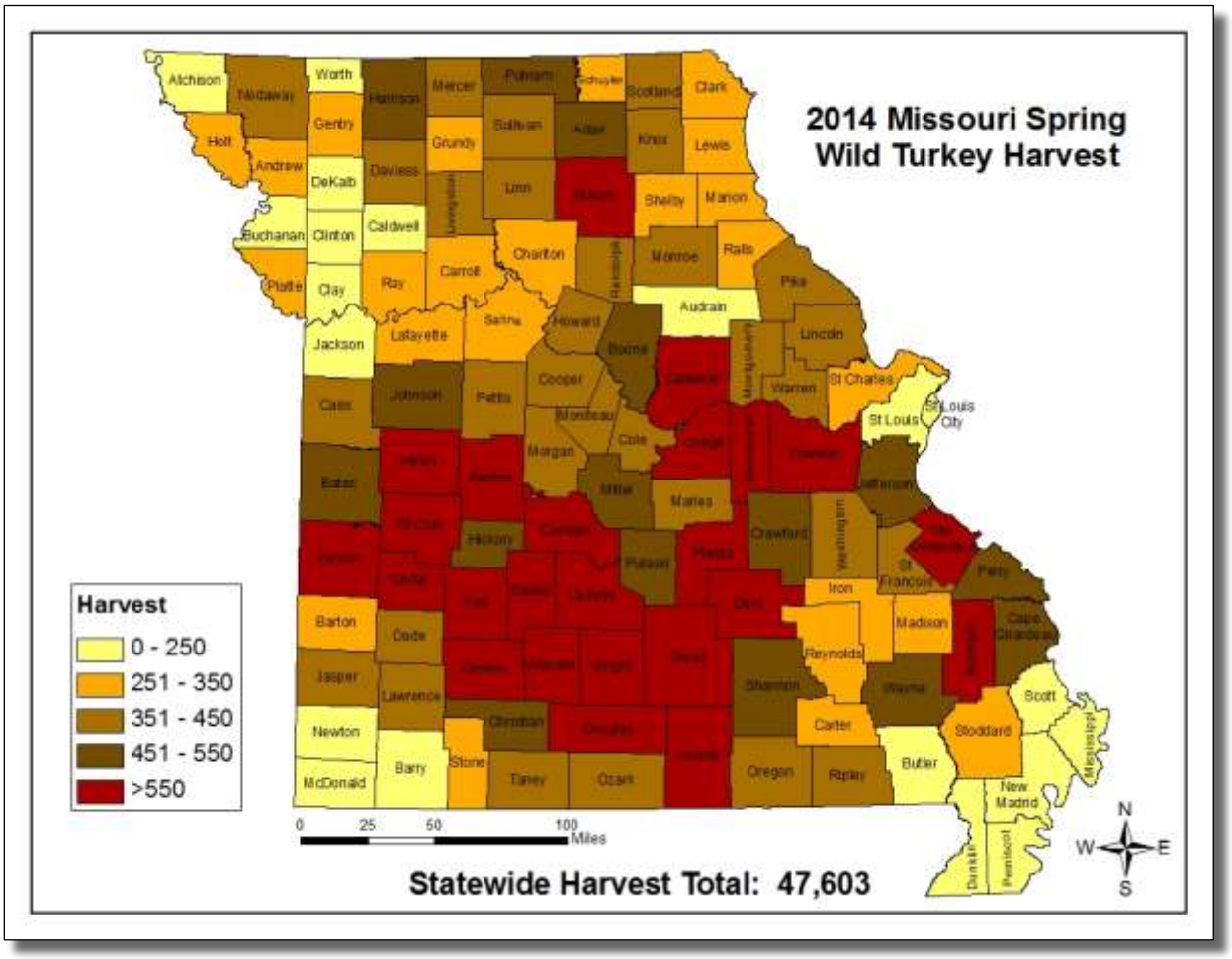


Figure 5. Total (youth and regular season) spring wild turkey harvest in Missouri, 2014.

Spring turkey hunting in Missouri is a popular activity with more than 500,000 days spent afield each year. Total permit sales for the 2014 spring turkey season (110,363; excluding no-cost landowner permits) declined by 3% from the 2013 spring permit sales total. Spring turkey permit sales during 2014 remain 15% below the permit sales record set in 2003 (Figure 6, Table 4). Spring turkey permit sales in 2014 included 103,514 (94%) resident permits and 7,122 (6%) non-resident permits. An additional 43,138 no-cost permits were distributed to resident landowners. The total number of spring turkey hunters in Missouri in 2014 was 148,911. The total number of hunters does not equal

the permit sales total because some hunters purchase a permit in addition to receiving a no-cost landowner permit.

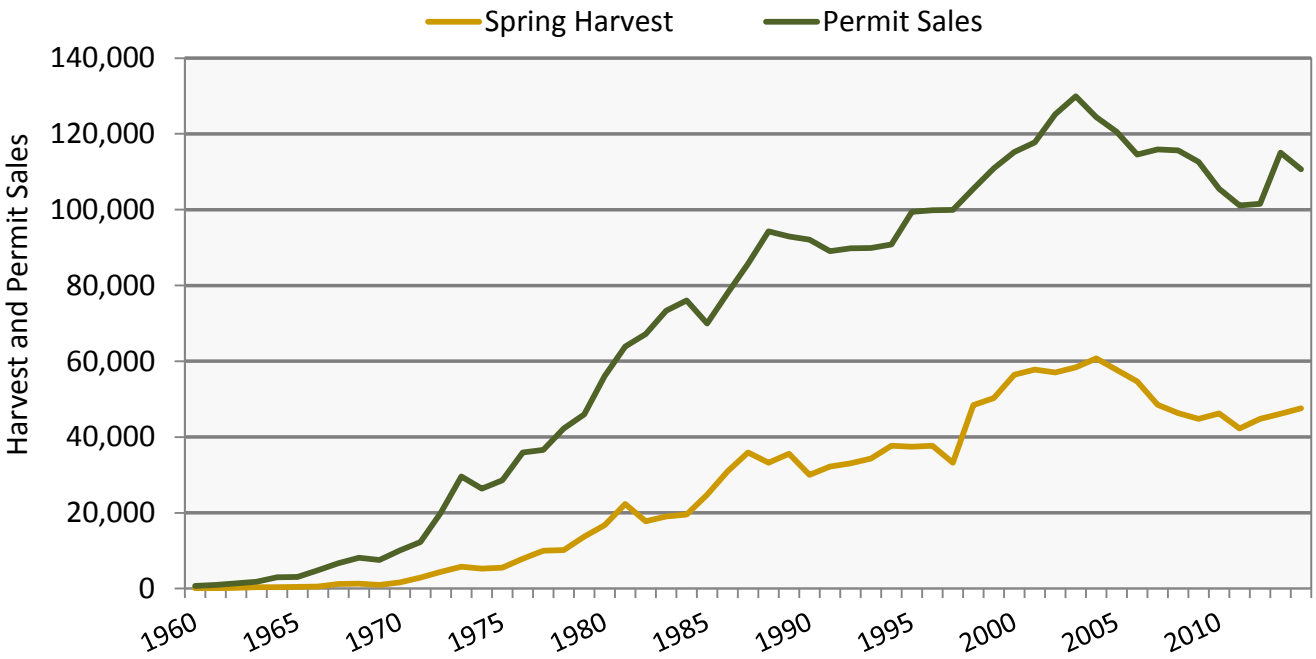


Figure 6. Number of wild turkeys harvested during the spring season (youth and regular season) in Missouri, and the number of turkey hunting permits sold for the spring season, 1960-2014. Permit sales do not include no-cost landowner permits.

Spring turkey harvest in Missouri during 2014 was 21% below the record harvest of over 60,000 birds in 2004 (Figure 6, Table 4). Spring turkey hunter success has stabilized since 2007 after declining during the early to mid-2000s (Figure 7). The success rate for permit-buyers during the 2014 spring season was 70 turkeys harvested per 1,000 hunting trips, which is slightly below the previous five-year average of 71 turkeys per 1,000 trips.

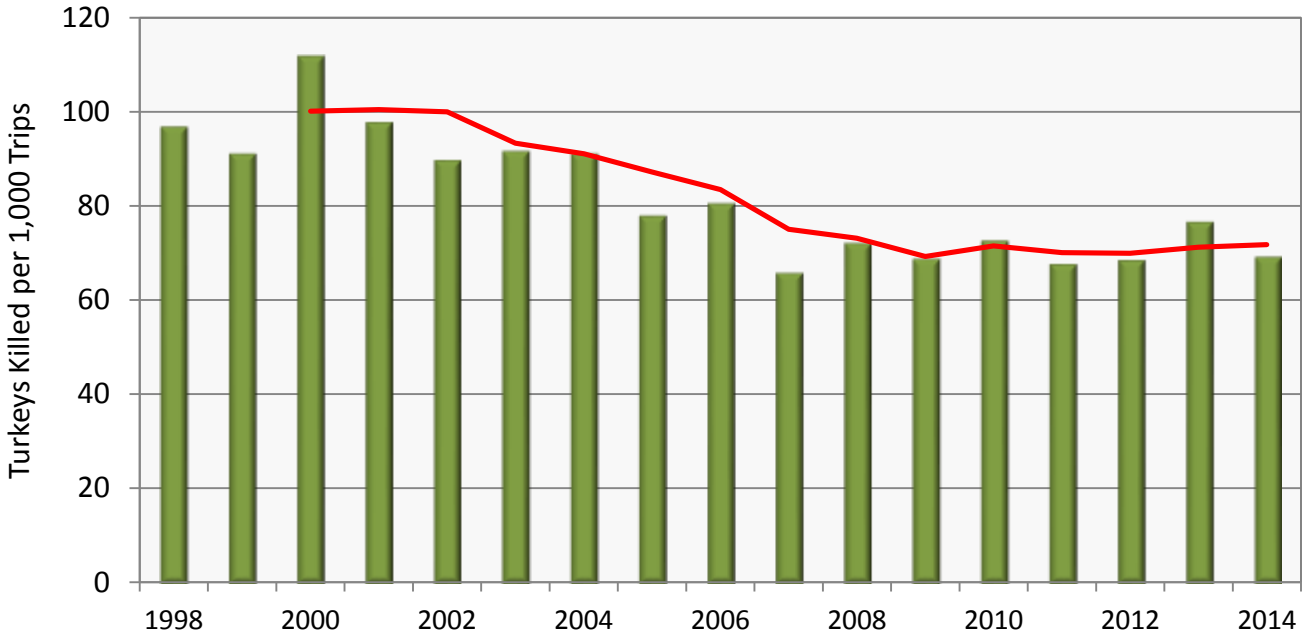


Figure 7. Statewide spring turkey hunter success in Missouri. Data are the number of turkeys harvested per 1,000 hunting trips, 1998-2014. Trendline (red) displays moving three-year average.

2014 Fall Firearms Turkey Season

The 2014 fall firearms turkey harvest total of 5,691 represented a 4% decrease in harvest from the 2013 season, and was 20% below the previous five-year average. The majority of the fall firearms harvest occurred in southern Missouri (Figure 8). The top three counties in harvest were Greene, Franklin, and St. Clair where 165, 163, and 160 turkeys were harvested, respectively.

Fall firearms turkey permit sales decreased by 5% in 2014. Of the 14,117 permits sold in 2014, 13,877 (98%) were purchased by Missouri residents and 240 (2%) by nonresidents; an additional 60,177 no-cost permits were distributed to resident landowners. Fall firearms turkey hunting in Missouri has generally been declining in popularity since the late 1980s when over 50,000 permits were sold and over 28,000 turkeys were harvested during the 14-day season (Figure 9, Table 5).

Although the novelty of the fall firearms turkey season may have worn off for some of Missouri's hunters, the increasing popularity of the archery deer and turkey season is likely to be partially responsible for the declining interest. Additionally, declining turkey numbers during the mid-to-late 2000s are likely to have reduced hunter participation in the fall season. Missouri is not alone in experiencing a declining trend in fall firearms turkey hunting participation, as even some states with a strong fall turkey hunting tradition (e.g., Pennsylvania, Virginia) have experienced a decline in fall turkey hunter numbers.

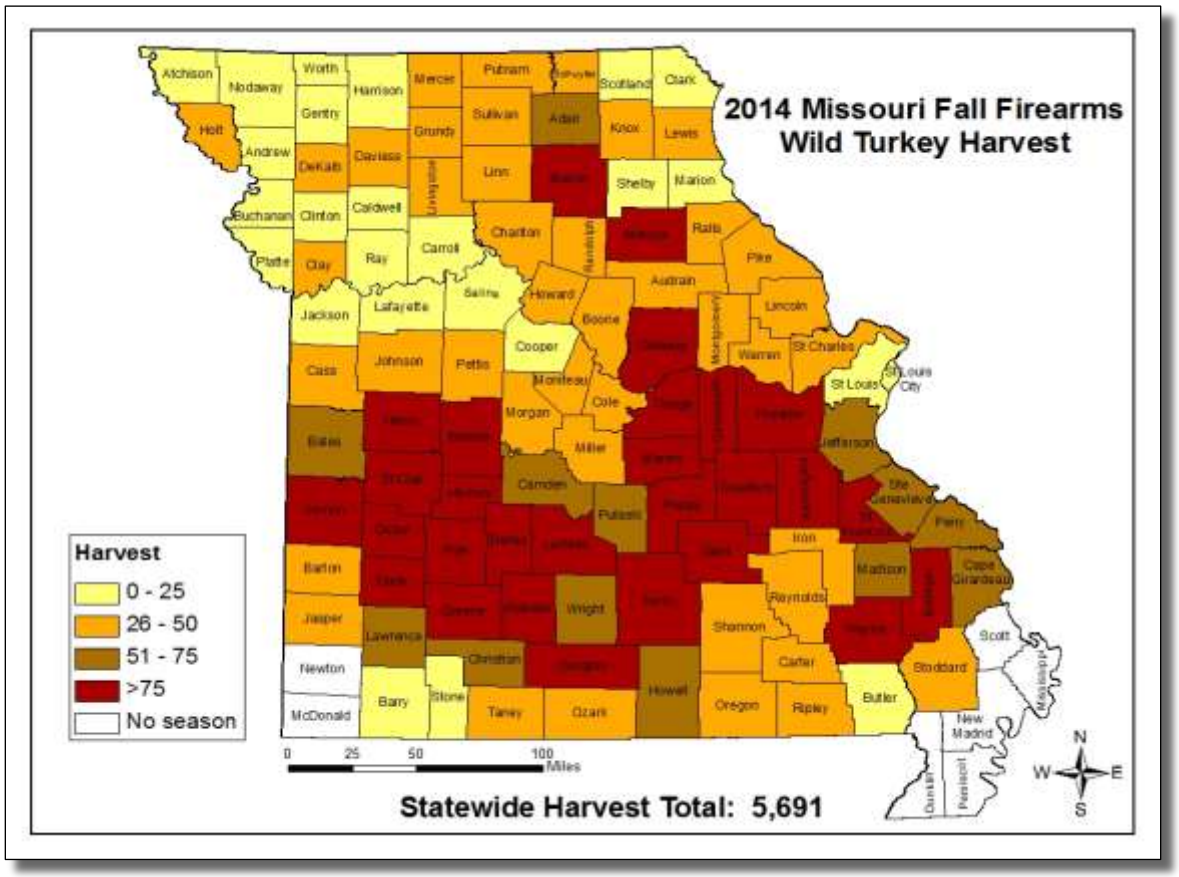


Figure 8. Missouri fall firearms wild turkey harvest, 2014.

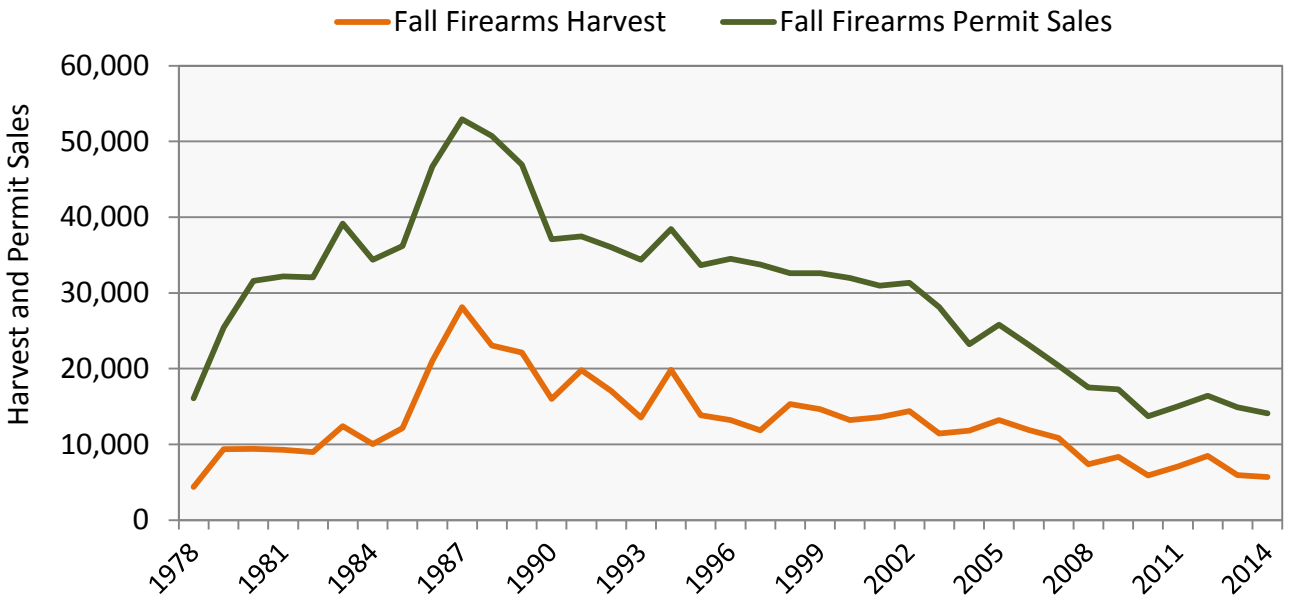


Figure 9. Number of wild turkeys harvested during the fall firearms turkey season in Missouri, and the number of fall firearms permits sold, 1978-2014. Permit sales do not include no-cost landowner permits.

Table 5. Fall firearms turkey harvest and permit sales[a] in Missouri, 1978-2014.

Year	Fall Firearms Harvest	% Change From Previous Year	Fall Permit Sales[a]	% Change From Previous Year
1978[b]	4,389	n/a	16,072	n/a
1979	9,387	+113.9	25,414	+58.1
1980[c]	9,424	+0.4	31,606	+24.4
1981	9,293	-1.4	32,199	+1.9
1982	8,989	-3.3	32,051	-0.5
1983	12,394	+37.9	39,160	+22.2
1984	10,034	-19.0	34,375	-12.2
1985	12,179	+21.4	36,218	+5.4
1986[d]	21,019	+72.6	46,688	+28.9
1987	28,139	+33.9	52,922	+13.4
1988	23,080	-18.0	50,715	-4.2
1989	22,131	-4.1	46,946	-7.4
1990	16,015	-27.6	37,080	-21.0
1991	19,788	+23.6	37,469	+1.0
1992	17,061	-13.8	36,033	-3.8
1993	13,569	-20.4	34,379	-4.6
1994	19,869	+46.4	38,424	+11.8
1995	13,866	-30.2	33,642	-12.6
1996	13,207	-4.8	34,522	+2.6
1997	11,866	-10.2	33,765	-2.2
1998	15,343	+29.3	32,593	-3.5
1999	14,651	-4.5	32,606	0.0
2000	13,230	-9.7	31,968	-2.0
2001	13,596	+2.8	30,949	-3.2
2002	14,392	+5.9	31,329	+1.2
2003	11,436	-20.5	28,108	-10.3

[a]Does not include no-cost landowner permits
[b]12-day season with one-bird bag limit
[c]Season length increased to 14 days
[d]Bag limit increased to two turkeys

Table 5. Continued

Year	Fall Firearms Harvest	% Change From Previous Year	Fall Permit Sales[a]	% Change From Previous Year
2004	11,824	+3.4	23,215	-17.4
2005[e]	13,233	+11.9	25,805	+11.2
2006	11,927	-9.9	23,141	-10.3
2007	10,859	-9.0	20,397	-11.9
2008	7,389	-32.0	17,533	-14.0
2009	8,351	+13.0	17,287	-1.4
2010	5,928	-29.0	13,736	-20.5
2011	7,077	+19.4	15,020	+9.3
2012	8,498	+20.1	16,413	+9.3
2013	5,931	-30.2	14,898	-9.2
2014	5,691	-4.0	14,117	-5.2

[e]Season length increased to 31 days

2014 Fall Archery Turkey Season

Hunters harvested 2,587 turkeys during the 2014 fall archery deer and turkey season (Figures 10, 11). The 2014 archery turkey harvest total represented a 1% increase from the 2013 season, and was 8% lower than the previous five-year average. Unlike the fall firearms turkey harvest, which has shown a declining trend since the late 1980s (Figure 9), the fall archery harvest increased until the mid-2000s. Since 2005, archery turkey harvests have fluctuated substantially on an annual basis, while showing a general trend towards stabilization (Figure 11, Table 6).

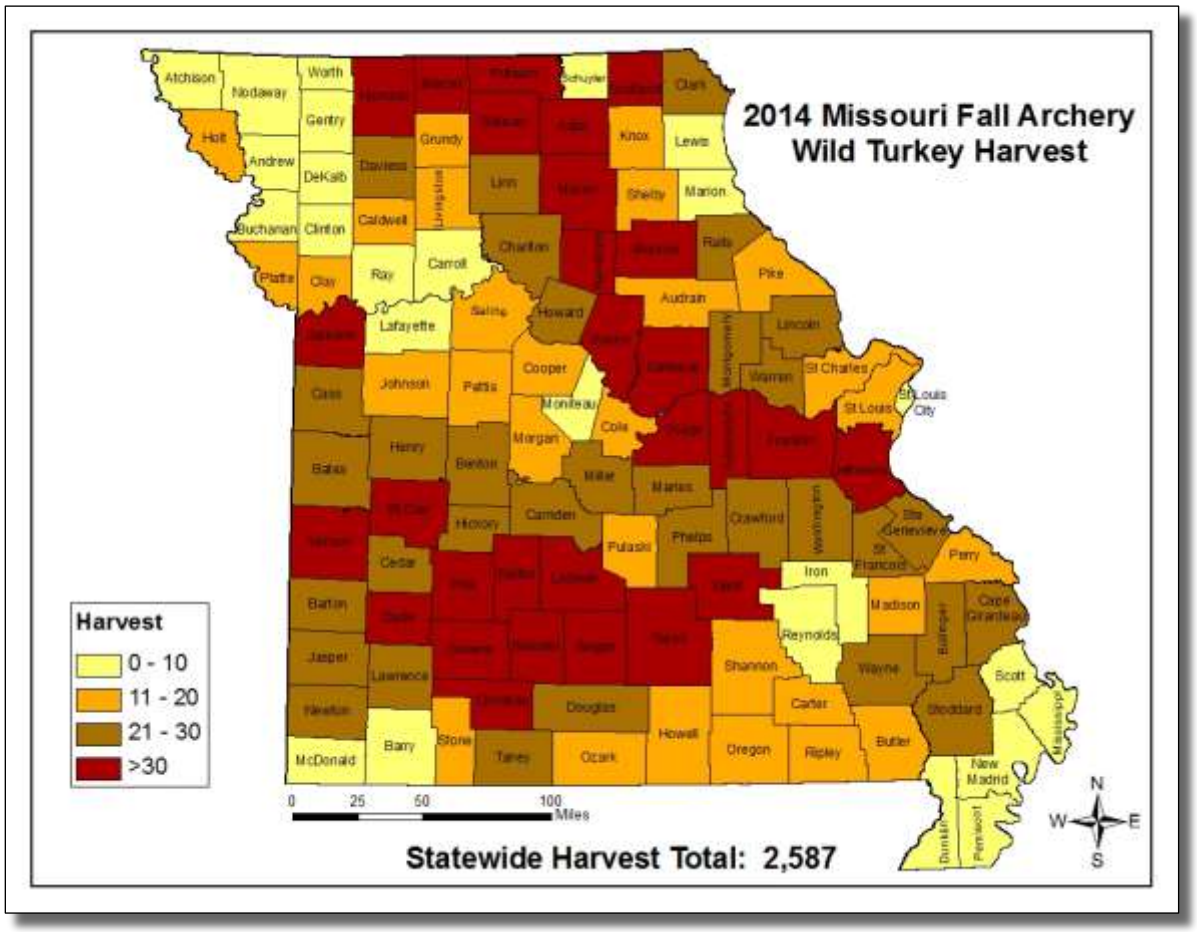


Figure 10. Missouri fall archery wild turkey harvest during the 2014 season.

Although archery permit sales were relatively stable from the mid-1990s through the mid-2000s, sales have since shown an increasing trend (Figure 12, Table 6). In 2014, 115,945 permits were sold; the second highest number since the season's inception. Of the archery permits sold in 2014, 107,052 (92%) were purchased by Missouri residents and 8,893 (8%) by non-residents. An additional 86,051 no-cost landowner permits were distributed.

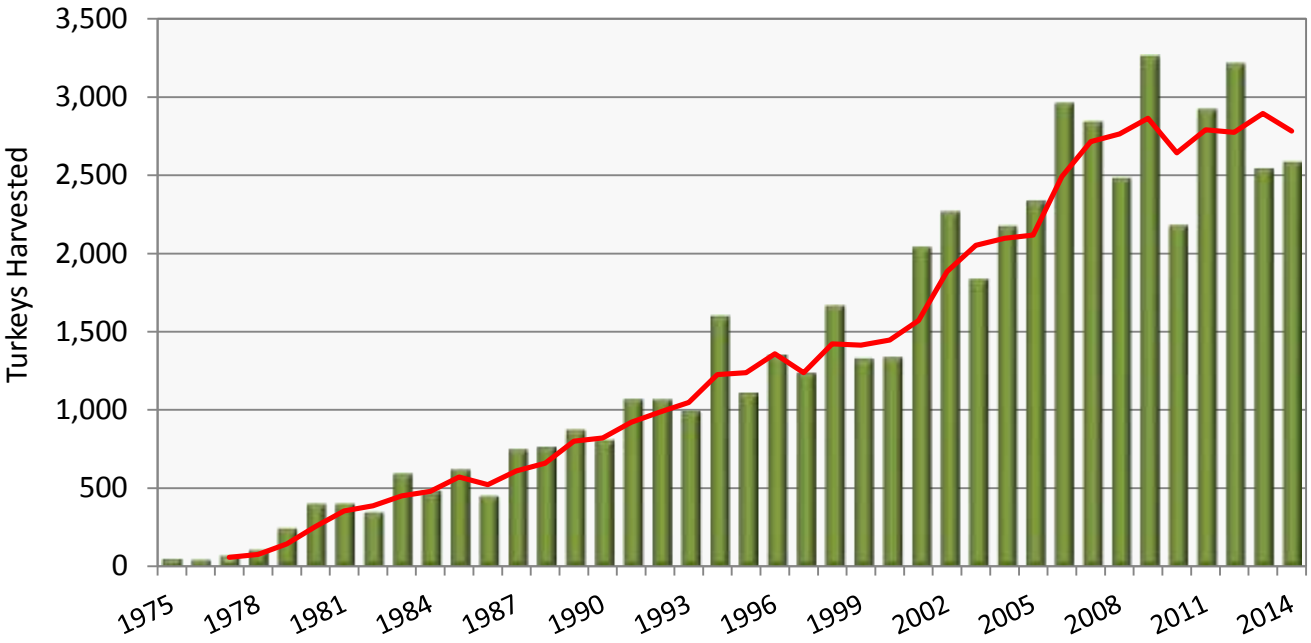


Figure 11. Missouri fall archery wild turkey harvest, 1975-2014. Trendline (red) displays three-year moving average.

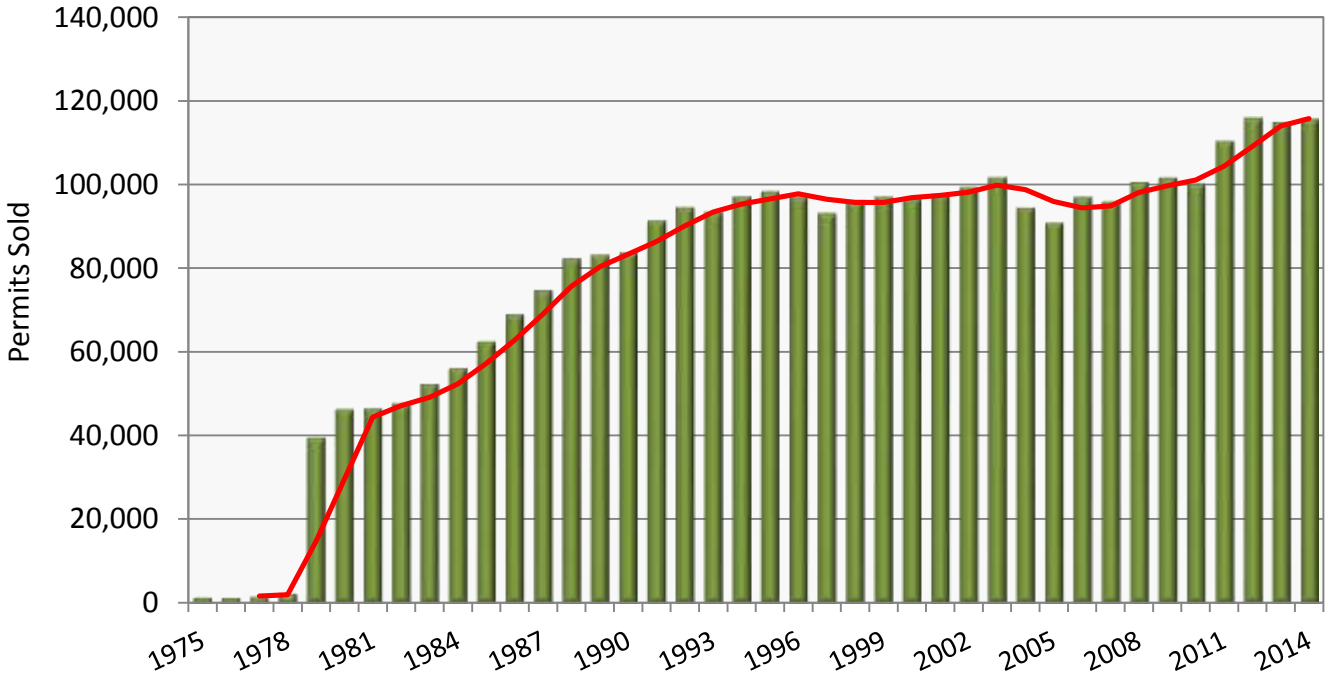


Figure 12. Missouri archery deer and turkey permit sales, 1975-2014. Permit sales do not include no-cost landowner permits. Prior to 1979, hunters purchased archery deer and turkey permits separately. Trendline (red) displays three-year moving average.

Table 6. Fall archery turkey harvest and permit sales[a] in Missouri, 1975-2014.

Year	Fall Archery Harvest	% Change From Previous Year	Fall Archery Permit Sales[a]	% Change From Previous Year
1975	54	n/a	1,568	n/a
1976	46	-14.8	1,469	-6.3
1977	72	+56.5	1,701	+15.8
1978	108	+50.0	2,478	+45.7
1979[b]	248	+129.6	39,830	+1,507.3
1980	406	+63.7	46,548	+16.9
1981	405	-0.2	46,776	+0.5
1982	349	-13.8	47,931	+2.5
1983	598	+71.3	52,666	+9.9
1984	488	-18.4	56,378	+7.0
1985	624	+27.9	62,731	+11.3
1986	454	-27.2	69,265	+10.4
1987	753	+65.9	75,064	+8.4
1988[c]	770	+2.3	82,612	+10.1
1989	878	+14.0	83,440	+1.0
1990	812	-7.5	84,018	+0.7
1991	1,073	+32.1	91,656	+9.1
1992	1,071	-0.2	94,835	+3.5
1993	999	-6.7	93,729	-1.2
1994	1,604	+60.6	97,441	+4.0
1995[d]	1,113	-30.6	98,601	+1.2
1996	1,357	+21.9	97,417	-1.2
1997	1,241	-8.5	93,402	-4.1
1998	1,670	+34.6	96,374	+3.2
1999	1,331	-20.3	97,345	+1.0
2000	1,340	+0.7	96,980	-0.4

[a]Does not include no-cost landowner permits
[b]Archery deer and archery turkey permits combined
[c]Bag limit increased from one to two turkeys
[d]Season expansion: October 1 – January 15

Table 6. Continued.

Year	Fall Archery Harvest	% Change From Previous Year	Fall Archery Permit Sales[a]	% Change From Previous Year
2001	2,043	+52.5	97,966	+1.0
2002	2,272	+11.2	99,630	+1.7
2003[e]	1,840	-19.0	102,012	+2.4
2004	2,333	+26.8	94,693	-7.2
2005	2,949	+26.4	91,152	-3.7
2006	2,823	-4.3	97,302	+6.7
2007	2,513	-11.0	96,204	-1.1
2008	2,484	-1.2	100,860	+4.8
2009	3,263	+31.4	101,930	+1.1
2010	2,184	-33.1	100,491	-1.4
2011	2,923	+33.8	110,647	+10.1
2012	3,217	+10.1	116,209	+5.0
2013	2,546	-20.9	115,157	-0.9
2014	2,587	+1.6	115,945	+0.01

[e]Season expansion: September 15 – January 15

HUNTING INCIDENTS

There were two fatal and six non-fatal hunting incidents during the 2014 spring turkey season (Figure 13). The number of spring turkey hunting incidents in Missouri has declined dramatically over the course of the last three decades. During the late 1980s, more than 30 incidents occurred annually for every 100,000 permits sold. During the last five hunting seasons, the average number of incidents per 100,000 permits sold was five.

REGULATION CHANGES

Other than changes to some conservation area and managed turkey hunts, no turkey hunting regulation changes occurred in 2014.

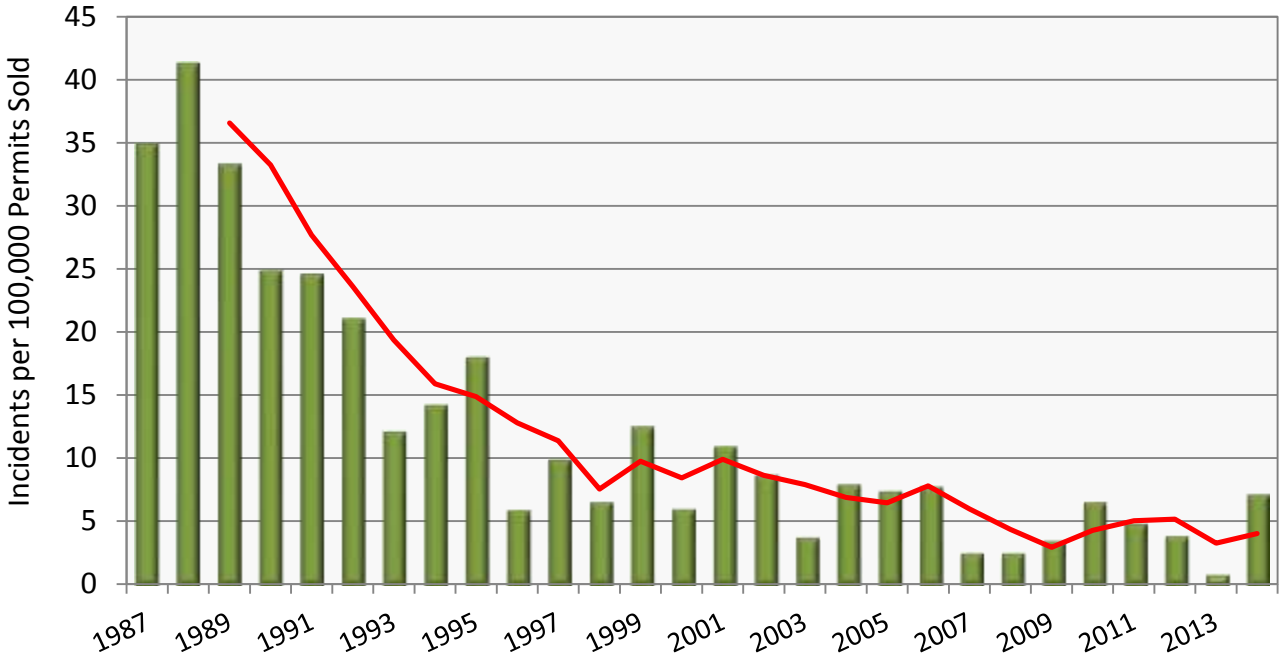


Figure 13. Hunting incidents during the spring turkey season in Missouri per 100,000 permits sold, 1987-2014. Trendline (red) displays three-year moving average.

POPULATION/ABUNDANCE INDEX – BOWHUNTER OBSERVATION SURVEY

Since 1983, MDC staff and citizen volunteers participating in the Conservation Department's Bowhunter Observation Survey have recorded the number of wild turkeys observed while archery hunting. Since survey participants also record the number of hours they bowhunt, an index of wild turkey abundance can be calculated at the statewide and regional scales.

In 2014, at the statewide scale, the number of turkeys observed per 1,000 hours bowhunting was 376 (Figure 14). At the regional scale, index values ranged from 125 in the Mississippi Lowlands to 488 in the Ozark Border (Table 7). The statewide average of 376 represented a 26% increase from 2013 and was 2% below the previous five-year average. The statewide index remains 15% and 29% below the previous 10 and 20-year averages, respectively (Table 7).

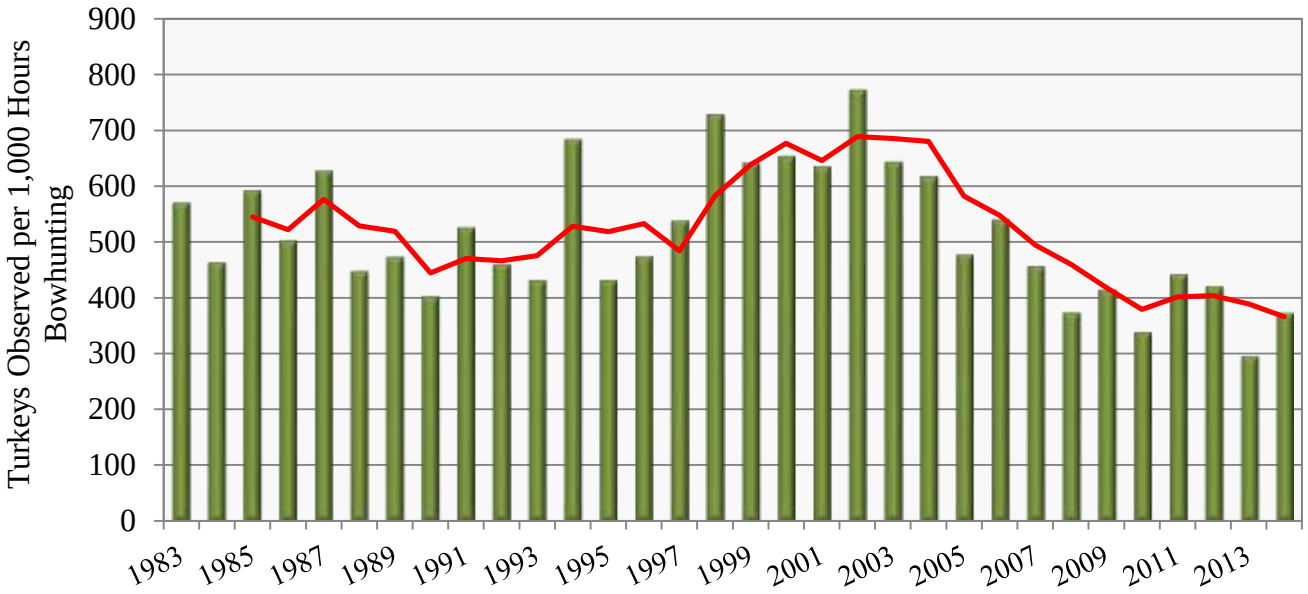


Figure 14. Wild turkey observations by bowhunters participating in the Missouri Department of Conservation's Bowhunter Observation Survey, 1983-2014. Data are the average number of turkeys observed per 1,000 hours bowhunting at the statewide scale. Trendline (red) displays three-year moving average.

Table 7. Index of wild turkey abundance in Missouri by Turkey Productivity Region (Figure 1). Data were obtained from the Conservation Department's Bowhunter Observation Survey. Index values are the average number of turkeys observed per 1,000 hours bowhunting. For each interval value, the % change indicates how the 2014 index compares to the previous year or the average for periodic intervals.

Productivity Region	2014 Index	1-year (2013) Change	5-year (2009-2013) Change	10-year (2004-2013) Change	20-year (1994-2013) Change
Lindley Breaks	253	0%	-24%	-28%	-39%
Mississippi Lowlands	125	-35%	-44%	-61%	-56%
Northeast	429	+43%	+9%	-11%	-35%
Northwest	447	+34%	-12%	-26%	-42%
Ozark Border	488	+49%	+28%	+12%	-10%
Ozarks East	233	+13%	-11%	-20%	-28%
Ozarks West	291	-6%	-13%	-22%	-34%
Union Breaks	386	+37%	+8%	-1%	-11%
West Prairie	451	+15%	-11%	-21%	-30%
Statewide	**376**	**+26%**	**-2%**	**-15%**	**-29%**

WILD TURKEY RESEARCH PROJECT UPDATE

Introduction

In 2013, the Conservation Department began a five-year wild turkey research project in north Missouri in partnership with the University of Missouri, University of Washington, and the National Wild Turkey Federation (NWTF). The study is being conducted in Putnam, Schuyler, Monroe, and Marion Counties. Funding for the research project is provided by the Conservation Department and grants from the U.S. Fish and Wildlife Service's Wildlife Restoration Program and the George Clark Missouri State Chapter of the NWTF. The research project will provide information that will be used by the Conservation Department's Wild Turkey Management Program to monitor the turkey population and assist with making decisions about hunting regulations. The Conservation Department uses a science-based approach to manage the state's wild turkey population, and this research project is just one of the many ways that the Conservation Department obtains the information used in its program.

The ultimate goal of the project is to develop population models, which will provide annual estimates of turkey population size, survival, harvest rates (proportion of the population shot by hunters), recruitment (number of young produced that enter the population), and the growth rate of the turkey population. A computer software program will also be developed to facilitate use of the population models. Researchers will be capturing and radiotracking turkeys throughout the four-county study area. During trapping efforts, all turkeys will be released in the same fields where they were captured. The field-based portion of the research project will provide the Conservation Department with estimates of seasonal and annual survival for gobblers, hens, and jakes, as well as harvest rate estimates during the spring and fall hunting seasons.

Fitting wild turkeys with radiotransmitters will allow researchers to track the birds and determine survival throughout the year in addition to identifying the various sources of mortality. Of central importance will be determining what proportion of gobblers and jakes are harvested during the spring hunting season. To facilitate harvest rate estimation, a toll-free phone number has been inscribed on each turkey band. Should a hunter happen to shoot a banded turkey, in addition to reporting their bird through the Telecheck system, the Conservation Department asks that they call the toll-free number on the band. The information gained from band returns is critically important to the success of the research project.

In addition to determining the proportion of gobblers and jakes that are harvested during the spring hunting season, researchers will be monitoring hens closely during the nesting and brood-rearing seasons. The study will allow researchers to answer some basic questions about wild turkey reproduction, including: What proportion of hens attempt to nest each year? Does this differ between adult and juvenile hens? What proportion of hens nest successfully? Of those hens that nest successfully, how many poults that hatch survive? Although previous research projects have shed light on the answers to these questions, brood survey results indicate considerable declines in wild turkey production since the last turkey research project was conducted in Missouri, and having

updated information is important. Wild turkeys will also be radiotracked during fall to determine what proportion of birds are harvested during the fall season.

Year 1 – Project Summary

Researchers and Conservation Department staff captured over 260 wild turkeys in the four-county study area during the first winter field season (December 2013 – March 2014). The capture total included over 140 jakes and gobblers and about 120 hens. During the 2014 spring turkey season, 10 of the 60 banded adult gobblers (17%) and 4 of the 65 banded jakes (6%) were harvested. Adult gobbler harvest rates during the first spring season of the study were lower than in the Missouri Ozarks, where an average of 23% and 30% of adult males were legally harvested on two study areas (Hubbard and Vangilder 2005). Adult gobbler harvest rates were also lower than in Kentucky (52%; Wright and Vangilder 2005), and in New York, Ohio, and Pennsylvania (35–39% among states; Diefenbach et al. 2012). Jake harvest rates were also lower than in the Missouri Ozarks (11% and 16% on two study areas; Hubbard and Vangilder 2005), in Kentucky (20%; Wright and Vangilder 2005), and in New York, Ohio, and Pennsylvania (17–27% among states; Diefenbach et al. 2012).

Researchers and Conservation Department staff were radiotracking 126 turkeys (38 adult gobblers, 55 jakes, and 33 hens) during the start of the 2014 fall turkey season. An additional 68 hens had been banded, of which approximately 50 were likely to be alive at the start of the fall hunting season. Of the 176 banded turkeys, three jakes (2% of all banded turkeys) were harvested by hunters during the fall firearms hunting season. None of the banded birds were harvested during the archery deer and turkey season.

During the first year of the project, the annual survival rate for radiotagged hens was 65%. Seasonal survival estimates for hens were 88%, 87%, 91%, and 93% for spring, summer, fall, and winter, respectively. First year hen survival in this study was greater than in New York (50%; Roberts et al. 1995), Wisconsin (53%; Wright et al. 1996), and in the Missouri Ozarks (51% and 56% for two study areas; Vangilder 1996), but lower than in Indiana (78%; Humberg et al. 2009). For adult gobblers, first year annual survival was 46%, which was greater than in the Missouri Ozarks (37% on two study areas; Hubbard and Vangilder 2005) and in Kentucky, where it ranged from 19–36% (Wright and Vangilder 2005). Annual survival for jakes during the first year of the study was 69%. As with adult gobblers, annual survival for jakes was greater than in the Missouri Ozarks (57% and 60% on two study areas; Hubbard and Vangilder 2005) and in Kentucky, where it ranged from 48–58% (Wright and Vangilder 2005). Seasonal survival estimates for all (adult gobblers and jakes) radiotagged males were 78%, 94%, 91%, 91% for spring, summer, fall, and winter, respectively. Predation was the leading cause of mortality for female and male radiotagged turkeys. Based on evidence at kill sites, coyotes, bobcats, and great-horned owls were suspected of killing radiotagged turkeys.

Of the hens radiotracked during the 2014 nesting season, the median date of initial nest incubation initiation was 16 May, which was later than in another northern Missouri study (4 May; Vangilder and Kurzejeski 1995), in Arkansas (3 May; Thogmartin and Johnson 1999), and in Virginia and West Virginia (5 May; Norman et al. 2001). Eighty-six percent of radiotagged adult hens initiated incubation of at least one nest, whereas only 20% of juvenile hens initiated incubation. Adult hen

nesting rate (proportion of hens that initiated incubation) was slightly lower than in another northern Missouri study (>90%; Vangilder and Kurzejeski 1995) and adult hens in New York (94%; Roberts et al. 1995), but greater than in the Missouri Ozarks (72% and 75% for two study areas; Vangilder et al. 2001). Juvenile hen nesting rate was lower than in another northern Missouri study (>90%; Vangilder and Kurzejeski 1995), and in New York (78%; Roberts et al. 1995) and Massachusetts (81%; Vander Haegen et al. 1988), however, only a small number of juvenile hens (5) were radiotagged during the first year of our study.

Of the hens being radiotracked that failed their initial nesting attempt, 47% initiated incubation of a second nest; all were adults. First year renesting rate (proportion of hens that initiated incubation of a second nest after failing their initial nesting attempt) in this study was similar to the renesting rate in Massachusetts (Vander Haegen et al. 1988), higher than in another northern Missouri study (41%; Vangilder and Kurzejeski 1995), and slightly less than in Wisconsin (55%; Paisley et al. 1998). Of the hens radiotracked during the nesting season, 27% were successful at hatching poults (known as female success). Female success was greater than in Arkansas (11%; Thogmartin and Johnson 1999), Louisiana (24%; Byrne and Chamberlain 2013), and Mississippi (25%; Miller et al. 1998), but less than in South Carolina (51%; Davis et al. 1995) and Virginia (52%; Godfrey and Norman 2001). Average clutch size for radiotagged hens was about 10 eggs, which is similar to clutch sizes in South Carolina (10 eggs; Davis et al. 1995), Wisconsin (11 eggs; Paisley et al. 1998), and another northern Missouri study (11 eggs; Vangilder and Kurzejeski 1995). Of the eggs in successful nests, 94% hatched (known as hatching rate), which was similar to the hatching rate in Mississippi (93%; Palmer et al. 1993), Virginia (92%; Godfrey and Norman 2001), and slightly greater than in another northern Missouri study (90%; Vangilder and Kurzejeski 1995). Of the poults that hatched from successful nests (known as poult survival), 47% survived to be 28 days old, which was identical or similar to poult survival estimates in Wisconsin (47%; Paisley et al. 1998), northern Missouri (46%; Vangilder and Kurzejeski 1995), and southern Iowa (40%; Hubbard et al. 1999), and greater than in Mississippi (23%; Palmer et al. 1993), and in the Missouri Ozarks (24% and 26% on two study areas; Vangilder et al. 2001).

Literature Cited

Byrne, M. E., and M. J. Chamberlain. 2013. Nesting ecology of wild turkeys in a bottomland hardwood forest. American Midland Naturalist 170:95-110.

Davis, J. R., H. R. Barnhill, D. C. Guynn, Jr., R. E. Larkin, and W. M. Baughman. 1995. Wild turkey nesting ecology in the Lower Coastal Plain of South Carolina. Proceedings of the Annual Conference of the Southeast Association of Fish and Wildlife Agencies 49:454-465.

Diefenbach, D. R., M. J. Casalena, M. V. Schiavone, M. Reynolds, R. Eriksen, W. C. Vreeland, B. Swift, and R. C. Boyd. 2012. Variation in spring harvest rates of male wild turkeys in New York, Ohio, and Pennsylvania. Journal of Wildlife Management 76:514-522.

Godfrey, C. L., and G. W. Norman. 2001. Reproductive ecology and nesting habitat of eastern wild turkeys in western Virginia. Proceedings of the National Wild Turkey Symposium 8:203-210.

Hubbard, M. W., D. L. Garner, and E. E. Klaas. 1999. Wild turkey poult survival in southcentral Iowa. Journal of Wildlife Management 63:199-203.

Hubbard, M. W., and L. D. Vangilder. 2005. Survival of eastern wild turkey males in the eastern Missouri Ozarks. Proceedings of the National Wild Turkey Symposium 9:316-366.

Humberg, L. A., T. L. Devault, and O. E. Rhodes, Jr. 2009. Survival and cause-specific mortality of wild turkeys in northern Indiana. American Midland Naturalist 161:313-322.

Miller, D. A., B. D. Leopold, and G. A. Hurst. 1998. Reproductive characteristics of a wild turkey population in central Mississippi. Journal of Wildlife Management 62:903-910.

Norman, G. W., J. C. Pack, C. I. Taylor, D. E. Steffen, and K. H. Pollock. 2001. Reproduction of eastern wild turkeys in Virginia and West Virginia. Journal of Wildlife Management 65:1-9.

Paisley, R. N., R. G. Wright, J. F. Kubisiak, and R. E. Rolley. 1998. Reproductive ecology of eastern wild turkeys in southwestern Wisconsin. Journal of Wildlife Management 62:911-916.

Palmer, W. E., S. R. Priest, R. S. Seiss, P. S. Phalen, and G. A. Hurst. 1993. Reproductive effort and success in a declining wild turkey population. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 47:138-147.

Roberts, S. D., J. M. Coffey, and W. F. Porter. 1995. Survival and reproduction of female wild turkeys in New York. Journal of Wildlife Management 59:437-447.

Thogmartin, W. E., and J. E. Johnson. 1999. Reproduction in a declining population of wild turkeys in Arkansas. Journal of Wildlife Management 63:1281-1290.

Vander Haegen, W. M., W. E. Dodge, and M. W. Sayre. 1988. Factors affecting productivity in a northern wild turkey population. Journal of Wildlife Management 52:127-133.

Vangilder, L. D. 1996. Survival and cause-specific mortality of wild turkeys in the Missouri Ozarks. Proceedings of the National Wild Turkey Symposium 7:21-31.

Vangilder, L. D., and E. W. Kurzejeski. 1995. Population ecology of the eastern wild turkey in northern Missouri. Wildlife Monographs 130.

Vangilder, L. D., M. W. Hubbard, and D. A. Hasenbeck. 2001. Reproductive ecology of eastern wild turkey females in the eastern Missouri Ozarks. National Wild Turkey Symposium 8:53-59.

Wright, G. A., and L. D. Vangilder. 2005. Survival and dispersal of eastern wild turkey males in western Kentucky. Proceedings of the National Wild Turkey Symposium 9:367-373.

Wright, R. G., R. N. Paisley, and J. F. Kubisiak. 1996. Survival of wild turkey hens in southwestern Wisconsin. Journal of Wildlife Management 60:313-320.

Appendix A. 2014 Missouri spring turkey harvest (youth and regular seasons combined).

County	Adult Males	Juvenile Males	Bearded Hens	Total	Rank[a]
Adair	412	68	8	488	33
Andrew	268	33	6	307	84
Atchison	177	24	2	203	100
Audrain	172	40	4	216	98
Barry	133	65	1	199	101
Barton	278	51	6	335	77
Bates	356	104	8	468	39
Benton	607	115	4	726	9
Bollinger	478	138	5	621	20
Boone	363	86	2	451	40
Buchanan	110	22	0	132	108
Butler	157	39	1	197	102
Caldwell	171	34	2	207	99
Callaway	593	159	20	772	5
Camden	504	84	4	592	21
Cape Girardeau	386	95	4	485	35
Carroll	296	37	2	335	78
Carter	289	28	2	319	80
Cass	301	81	2	384	60
Cedar	582	109	14	705	11
Chariton	276	65	0	341	75
Christian	436	102	9	547	25
Clark	303	43	3	349	72
Clay	155	33	1	189	103
Clinton	150	34	4	188	104
Cole	301	78	4	383	61
Cooper	302	53	3	358	70
Crawford	375	96	10	481	36
Dade	310	72	5	387	58
Dallas	535	102	3	640	16
Daviess	331	69	2	402	54
DeKalb	229	19	2	250	96
Dent	520	109	11	640	17
Douglas	597	87	9	693	12
Dunklin	14	6	1	21	114
Franklin	760	254	14	1,028	1

[a]Rank based on total harvest in Missouri's 114 counties

Appendix A. Continued.

County	Adult Males	Juvenile Males	Bearded Hens	Total	Rank[a]
Gasconade	502	132	6	640	18
Gentry	222	33	3	258	92
Greene	676	117	8	801	4
Grundy	277	35	6	318	81
Harrison	417	66	4	487	34
Henry	503	125	5	633	19
Hickory	431	61	5	497	32
Holt	254	21	3	278	88
Howard	347	67	2	416	49
Howell	467	98	10	575	24
Iron	276	37	3	316	82
Jackson	212	33	2	247	97
Jasper	290	90	13	393	57
Jefferson	435	97	5	537	27
Johnson	415	86	6	507	30
Knox	349	52	3	404	53
Laclede	689	127	12	828	3
Lafayette	230	44	1	275	89
Lawrence	300	106	6	412	52
Lewis	247	40	2	289	86
Lincoln	285	81	11	377	65
Linn	312	65	4	381	63
Livingston	312	56	3	371	69
Macon	533	139	8	680	14
Madison	230	60	1	291	85
Maries	317	108	8	433	46
Marion	200	50	1	251	95
McDonald	60	18	1	79	111
Mercer	379	53	4	436	45
Miller	429	99	5	533	28
Mississippi	54	5	1	60	112
Moniteau	285	65	5	355	71
Monroe	354	84	4	442	44
Montgomery	320	91	8	419	48
Morgan	347	68	1	416	50
New Madrid	88	7	1	96	110

[a]Rank based on total harvest in Missouri's 114 counties

Appendix A. Continued.

County	Adult Males	Juvenile Males	Bearded Hens	Total	Rank[a]
Newton	92	37	2	131	109
Nodaway	331	43	3	377	66
Oregon	345	67	2	414	51
Osage	582	143	9	734	7
Ozark	319	74	3	396	56
Pemiscot	38	3	0	41	113
Perry	372	103	6	481	37
Pettis	380	62	1	443	43
Phelps	488	90	8	586	22
Pike	310	61	4	375	68
Platte	210	44	3	257	93
Polk	622	128	10	760	6
Pulaski	433	62	9	504	31
Putnam	441	67	7	515	29
Ralls	232	71	5	308	83
Randolph	341	75	4	420	47
Ray	231	48	4	283	87
Reynolds	313	34	0	347	73
Ripley	304	72	2	378	64
Saint Charles	282	55	2	339	76
Saint Clair	637	87	8	732	8
Saint Francois	291	104	4	399	55
Saint Louis	130	17	1	148	105
Sainte Genevieve	556	129	5	690	13
Saline	269	71	5	345	74
Schuyler	223	39	6	268	90
Scotland	326	46	4	376	67
Scott	120	21	2	143	107
Shannon	439	39	1	479	38
Shelby	236	27	3	266	91
Stoddard	207	45	4	256	94
Stone	252	65	5	322	79
Sullivan	384	64	1	449	41
Taney	370	77	1	448	42
Texas	839	158	13	1010	2
Vernon	478	91	7	576	23

[a]Rank based on total harvest in Missouri's 114 counties

Appendix A. Continued.

County	Adult Males	Juvenile Males	Bearded Hens	Total	Rank[a]
Warren	300	80	3	383	62
Washington	311	72	3	386	59
Wayne	432	108	3	543	26
Webster	595	97	14	706	10
Worth	127	17	1	145	106
Wright	554	111	9	674	15
Totals	**39,013**	**8,054**	**536**	**47,603**	

[a]Rank based on total harvest in Missouri's 114 counties

Appendix B. 2014 Missouri fall turkey harvest (firearms and archery seasons combined).

County	Adult Males	Adult Females	Juvenile Males	Juvenile Females	Total	Rank[a]
Adair	23	25	15	27	90	34
Andrew	1	5	1	16	23	102
Atchison	5	16	2	8	31	93
Audrain	12	20	7	15	54	68
Barry	4	6	4	4	18	106
Barton	20	19	8	18	65	53
Bates	22	25	6	21	74	43
Benton	22	36	15	45	118	21
Bollinger	25	38	20	42	125	17
Boone	16	32	9	23	80	37
Buchanan	3	2	1	0	6	109
Butler	2	8	7	18	35	89
Caldwell	4	13	3	6	26	99
Callaway	34	51	16	37	138	11
Camden	15	34	11	29	89	35
Cape Girardeau	12	40	11	30	93	31
Carroll	11	6	4	13	34	92
Carter	5	9	8	25	47	74
Cass	11	29	9	23	72	45
Cedar	27	42	30	47	146	8
Chariton	10	18	7	22	57	64
Christian	32	22	11	27	92	33
Clark	10	12	6	7	35	90
Clay	14	11	4	17	46	76
Clinton	1	10	3	6	20	104
Cole	7	16	10	22	55	67
Cooper	10	14	7	11	42	81
Crawford	17	31	23	46	117	24
Dade	37	34	22	29	122	19
Dallas	34	40	25	46	145	9
Daviess	11	25	11	22	69	50
DeKalb	8	9	8	12	37	87
Dent	27	28	23	72	150	7
Douglas	20	40	19	56	135	12
Dunklin	0	1	1	0	2	114

[a]Rank based on total harvest in Missouri's 114 counties

Appendix B. Continued.

County	Adult Males	Adult Females	Juvenile Males	Juvenile Females	Total	Rank[a]
Franklin	24	74	40	85	223	2
Gasconade	29	38	24	48	139	10
Gentry	5	3	3	9	20	105
Greene	51	69	35	74	229	1
Grundy	13	10	3	16	42	82
Harrison	17	22	6	15	60	59
Henry	21	38	28	42	129	16
Hickory	20	41	11	41	113	26
Holt	13	13	3	12	41	83
Howard	11	12	7	17	47	75
Howell	18	6	19	26	69	51
Iron	9	12	10	22	53	69
Jackson	13	21	3	8	45	78
Jasper	19	24	11	15	69	52
Jefferson	12	50	18	38	118	22
Johnson	15	12	9	23	59	61
Knox	6	13	6	24	49	73
Laclede	32	60	23	81	196	4
Lafayette	4	6	6	12	28	96
Lawrence	16	28	13	19	76	42
Lewis	5	10	10	14	39	84
Lincoln	13	22	5	18	58	63
Linn	10	23	8	31	72	46
Livingston	10	21	11	19	61	57
Macon	26	31	23	50	130	15
Madison	12	13	19	27	71	48
Maries	22	28	14	39	103	30
Marion	5	6	6	18	35	91
McDonald	2	3	2	0	7	108
Mercer	20	34	12	18	84	36
Miller	12	11	15	24	62	55
Mississippi	1	0	1	3	5	110
Moniteau	5	12	9	18	44	80
Monroe	16	32	26	60	134	13
Montgomery	14	26	16	22	78	39

[a]Rank based on total harvest in Missouri's 114 counties

Appendix B. Continued.

County	Adult Males	Adult Females	Juvenile Males	Juvenile Females	Total	Rank[a]
Morgan	13	15	2	21	51	72
New Madrid	1	3	1	0	5	111
Newton	7	9	3	2	21	103
Nodaway	6	3	9	8	26	100
Oregon	16	12	10	19	57	65
Osage	15	34	21	48	118	23
Ozark	11	16	12	22	61	58
Pemiscot	2	0	0	1	3	113
Perry	18	24	14	37	93	32
Pettis	10	19	7	10	46	77
Phelps	9	37	19	40	105	28
Pike	7	22	5	18	52	70
Platte	11	10	6	10	37	88
Polk	26	44	23	41	134	14
Pulaski	14	15	14	30	73	44
Putnam	12	27	15	18	72	47
Ralls	11	18	5	30	64	54
Randolph	13	24	11	30	78	40
Ray	8	9	3	8	28	97
Reynolds	8	13	9	22	52	71
Ripley	8	5	10	15	38	86
Saint Charles	11	24	12	13	60	60
Saint Clair	24	59	51	69	203	3
Saint Francois	17	26	20	46	109	27
Saint Louis	3	14	2	6	25	101
Sainte Genevieve	12	23	11	34	80	38
Saline	5	11	2	10	28	98
Schuyler	12	11	4	12	39	85
Scotland	20	15	7	15	57	66
Scott	0	2	0	2	4	112
Shannon	12	10	7	16	45	79
Shelby	8	10	1	11	30	95
Stoddard	9	24	16	28	77	41
Stone	12	7	3	9	31	94
Sullivan	22	13	11	24	70	49

[a]Rank based on total harvest in Missouri's 114 counties

Appendix B. Continued.

County	Adult Males	Adult Females	Juvenile Males	Juvenile Females	Total	Rank[a]
Taney	20	12	5	22	59	62
Texas	41	58	22	55	176	5
Vernon	21	36	31	26	114	25
Warren	6	27	3	26	62	56
Washington	15	34	21	35	105	29
Wayne	23	34	18	45	120	20
Webster	37	43	25	54	159	6
Worth	4	1	2	1	8	107
Wright	24	31	22	48	125	18
Totals	**1,617**	**2,475**	**1,317**	**2,867**	**8,276**	

[a]Rank based on total harvest in Missouri's 114 counties

Missouri Department of Conservation